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10/561,303	12/19/2005	Mitsuru Shingyohuchi	2271/75606	2807

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EXAMINER	
LEGESSE, HENOK D	

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2861	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/561,303	SHINGYOHUCHI ET AL.	
	Examiner	**Art Unit**	
	HENOK LEGESSE	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12 December 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-15 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1,2,3,5, and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term “nearly " in claims 1, 2, 3, 5, and 6 is a relative term which renders the claims indefinite. The term “nearly " is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear how close or near is the claimed value with respect to the limitation following the term “nearly”.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 7-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Kusunoki et al.(US 2004/0207671 / WO 2003/026897).

Regarding claim 1, Kusunoki et al teaches an image formation apparatus (fig.4) capable of forming a relatively large ink drop by sequentially discharging a plurality of ink drops from an

ink drop discharging head (paragraph0114, fig.6), the sequential ink drops merging before reaching a print target medium (paragraph 0119), the image formation apparatus comprising:

pressure generating means (52, fig.6) for discharging one or more of the ink drops other than an ink drop that is not followed by any more of the ink drops in a given printing cycle (the last ink drop) (see fig.11a-11b and paragraphs 0114-0119) at an interval nearly equal to (n+1/2) x Tc, where n is an integer equal to or greater than 1, and Tc represents a resonance cycle of a pressurized ink chamber of the image formation apparatus, the interval being measured from when a corresponding preceding ink drop is discharged (see fig.11a-11b and equation1 in paragraph 0117; each driving pulse in fig.11a discharges an ink droplet at an interval equals to tr + Pw+tf+td = nxTs where n is an integer equal to or greater than 1, and Ts represents a resonance cycle of a pressurized ink chamber. And the value of nxTs is nearly equal to (n+0.5) x Tc).

Regarding claim 2, Kusunoki et al further teaches the one or more of the ink drops other than the last ink drop are discharged at an interval nearly equal to 1.5 x Tc (see the equation1 in paragraph 0117, tr + Pw+tf+td = nxTs. When n is equal to 1 or 2 the interval is nearly equal to 1.5 x Tc).

Regarding claim 3, Kusunoki et al further teaches ink drops other than the one or more ink drops that are discharged at an interval nearly equal to (n+1/2) x Tc are discharged at an interval nearly equal to n x Tc (see fig.11a-11b and equation1 in paragraph 0117, each driving

pulse in fig.11a discharges an ink droplet at an interval equals to nxTs, which is also nearly equal to (n+0.5) x Tc).

Regarding claim 7, Kusunoki et al further teaches wherein four or more of the sequential ink drops (fig.11, paragraphs 0114) merge during flight to form one of the relatively large ink drops (paragraph 0119).

Regarding claim 8, Kusunoki et al further teaches a waveform containing driving pulses for discharging the sequential ink drops (fig.12) includes a waveform for suppressing a residual vibration after a driving pulse for discharging the last ink drop (paragraphs 0124,0129).

Regarding claim 9, Kusunoki et al further teaches the waveform for suppressing the residual vibration (figs.12, 13; paragraph 0124) is provided within an elapsed time equivalent to Tc (fig.14) after the last ink drop is discharged (paragraphs 0129,0130).

Regarding claim 10, Kusunoki et al further teaches a medium-sized ink drop (Mj2, fig.16; paragraph 0144) and a small-sized ink drop (Mj3, fig.16; paragraph 0138) are each formed by selecting a part of driving pulses (fig.15) for forming the relatively large ink drop (Mj1, fig.16; paragraph 0141-0142).

Regarding claim 11, Kusunoki et al further teaches the driving pulses include a waveform for vibrating a meniscus without causing an ink drop to be discharged (paragraph 0136).

Regarding claim 12, Kusunoki et al further teaches the driving pulses (figs.10, 11) include a section wherein a voltage is applied to the pressure generating means (52,fig.6) for pressurizing ink in the pressurized ink chamber (46) (paragraphs 0110,0139).

Regarding claim 13, Kusunoki et al further teaches the pressure generating means (52,figs.6, 7) is a piezoelectric device (paragraph 0092), and the piezoelectric device (52) is recharged in the section wherein said voltage is applied (paragraph 0093).

Regarding claim 14, Kusunoki et al further teaches wherein the pressure generating means (52,fig.6) for generating the pressure for pressurizing the ink of the pressurized ink chamber is a piezoelectric device (paragraph 0092), a displacement direction of which is d33 (arrow A in fig.7, paragraph 0093).

Regarding claim 15, Kusunoki et al further teaches support sections (64,fig.8) of the piezoelectric device (fig.8) support partitions of the pressurized ink chamber (46) (see also figs.6, 7; there is a support structure to support ink chamber 46).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 4 - 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusunoki et al. (US 2004/0207671 / WO 2003/026897).

Regarding claim 4, Kusunoki et al further teaches an ink drop is discharged by the pressurized ink chamber being contracted (by the rising edge of the 2^{nd},3^{rd},... pulses in figs.11, 15) after being expanded (by the falling edge of the 1^{st},2^{nd},3^{rd},... pulses in figs.11,15), where a volume of contraction (by the rising edge of the 2^{nd},3^{rd},... pulses in fig.15) is greater than a volume of expansion (by the falling edge of the 2^{nd},3^{rd},... pulses in fig.15), and where the volume of expansion may take a positive value or zero (see fig.15 the falling edge of the 2^{nd},3^{rd} pulse take a positive value) (see also fig.10 and paragraph 0107).

Kusunoki et al does not expressly teach the ink drop formed by the above pulses is a first ink drop. However, it would been obvious to one ordinary skill to rearrange the supply of the pulse elements for ejecting the first ink drop by first supplying the falling edge followed by rising edge of pulse elements as mentioned above.

Regarding claim 5, Kusunoki et al further teaches a second ink drop is discharged at an interval nearly equal to (n+1/2) x Tc from the first ink drop that precedes the second ink drop (see fig.11a-11b and equation1 in paragraph 0117, each driving pulse in fig.11a discharges an ink droplet at an interval equals to nxTs, which is nearly equal to (n+0.5) x Tc).

Regarding claim 6, Kusunoki et al substantially teaches the claimed invention (see figs.11, 24, 25) except for the speed of one of the ink drops is set at greater than 3 m/s, and at a speed at which the sequential ink drops are merged. It would have been obvious to one having ordinary skill in the art at the time the invention was made to eject an ink drop at greater than 3 m/s, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233

7. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa (US 6,254,213) in view of Matsuo et al. (US 6,488,349).

Regarding claim 1, Ishikawa teaches an image formation apparatus (figs.8,9 and controller 625 in fig.4) capable of forming a relatively large ink drop by sequentially discharging

a plurality of ink drops from an ink drop discharging head (600), the image formation apparatus (figs.4,8,9) comprising:

pressure generating means (603,619,621, figs.8) for discharging one or more of the ink drops other than an ink drop that is not followed by any more of the ink drops in a given printing cycle (the last ink drop) at an interval nearly equal to (n+1/2) x Tc, where n is an integer equal to or greater than 1, and Tc represents a resonance cycle of a pressurized ink chamber of the image formation apparatus, the interval being measured from when a corresponding preceding ink drop is discharged (the driving wave form in fig.1 is applied to the electrodes of the ink drop discharge head 600 by the controller 625 in fig.4. The interval between the ink drop ejecting pulses in fig.1 is equal to (N + 0.5) x T).

Ishikawa does not expressly teach the sequential ink drops merges before reaching a print target medium.

However, from the same endeavor Matsuo et al teaches merging sequential ink drops (figs.7,14) before reaching a print target medium (41, fig.1) in order to form large ink drop. The ink drops are merged by ejecting the ink drops such that the later discharged ink droplet has a higher discharge velocity than that of a previously discharged ink droplet for example by adjusting voltage amplitude as shown in figs.16 and 17 (also by adjusting other parameters of the wave forms as shown in figs.12,13, and 15).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the driving wave form of Ishikawa (fig.1) to cause ejections such that the sequential ink drops ejected merges before reaching a print target medium during formation of large ink drops based on the teachings of Matsuo et al (figs.14, 16, 17). The

motivation being in this method of forming large ink drops, all of the merged ink drops reaches the recording medium at the same time (at once), thus the merged ink drops dry uniformly which improves the uniformity ,quality, of the large ink drops formed thereby enhancing the printing image quality.

Regarding claim 2, Ishikawa further teaches wherein one or more of the ink drops other than the last ink drop are discharged at an interval nearly equal to 1.5 x Tc (see fig.1, when the value of the integer N is set to be equal to 1, then the interval between the pulses becomes 1.5 x Tc).

Regarding claim 3, Ishikawa further teaches ink drops other than the one or more ink drops that are discharged at an interval nearly equal to (n+1/2) x Tc (interval (N + 0.5) x T between the ink drop ejecting pulses in fig.1) are discharged at an interval nearly equal to n x Tc (see figs.2B, 3B, 6B, and 6C; shows interval equal to even or odd integer times Tc).

Regarding claim 4, Ishikawa further teaches wherein a first ink drop is discharged by the pressurized ink chamber (613, fig.8) being contracted after being expanded, where a volume of contraction is greater than a volume of expansion, and where the volume of expansion may take a positive value or zero (in the ink drop discharge head 600 of figs.8,9, ink drops are ejected by first expanding the chamber 613 as shown in fig.9, then by contracting the chamber to its original position as shown in fig.8. see col.1, line 61- col.2, line 32 of Ishikawa. The amount of

expansion and contraction can be controlled by the voltage applied to the electrodes. see figs.7B, 8, 9, 16 of Matsuo et al).

Regarding claim 5, Ishikawa further teaches a second ink drop is discharged at an interval nearly equal to (n+1/2) x Tc from the first ink drop that precedes the second ink drop (the interval between the first, second, third,…, ejecting pulses in fig.1 is equal to (N + 0.5) x T).

Regarding claim 6, Ishikawa further teaches wherein the speed of ink drops is set at greater than three m/s (see figs.2 and 3, the speed of the ink drops is 5-9 m/s in fig.2 and 20-60 in fig.3).

Regarding claim 7, Ishikawa as modified by Matsuo et al. further teaches wherein four or more of the sequential ink drops merge during flight to form one of the relatively large ink drops (Matsuo et al in figs.7, and 14 teaches the merging of 3 ink droplets to form large ink drop Q123, figs.12b, 13b, 15b, 16b, 17b teaches how to select the required number of ejecting pulses that merges to from large ink drop. Thus it is obvious to form a large ink drop by merging four or more ink drops depending on the size of the large ink drop and the merging ink drops).

Regarding claim 8, Ishikawa as modified by Matsuo et al further teaches a waveform containing driving pulses (fig.1of Ishikawa, figs.16, 17 of Matsuo et al) for discharging the sequential ink drops includes a waveform for suppressing a residual vibration after a driving pulse for discharging the last ink drop (S13 in fig.9, P15 in fig.11 of Matsuo et al).

Regarding claim 9, Ishikawa as modified by Matsuo et al further teaches the waveform for suppressing the residual vibration (S13 in fig.9, P15 in fig.11 of Matsuo et al) is provided within an elapsed time equivalent to Tc after the last ink drop is discharged (fig.1of Ishikawa).

Regarding claim 10, Ishikawa as modified by Matsuo et al further teaches a medium-sized ink drop and a small-sized ink drop are each formed by selecting a part of driving pulses for forming the relatively large ink drop (see fig.3 of Ishikawa teaches droplets of different volume. fig.14 of Matsuo et al teaches small ink drops Q1 and Q2 formed a medium size drop Q12 and a small drop Q3 and medium drop Q12 forms large drop Q123).

Regarding claim 11, Ishikawa as modified by Matsuo et al further teaches the driving pulses include a waveform for vibrating a meniscus without causing an ink drop to be discharged (S13 in fig.9, P15 in fig.11 of Matsuo et al).

Regarding claim 12, Ishikawa as modified by Matsuo et al further teaches the driving pulses (fig.1 of Ishikawa) include a section wherein a voltage is applied to the pressure generating means (603,619 of fig.8) for pressurizing ink in the pressurized ink chamber (613) (see also figs. 6-9,11,16 of Matsuo et al).

Regarding claim 13, Ishikawa as modified by Matsuo et al further teaches the pressure generating means (603,619 of fig.8 of Ishikawa) is a piezoelectric device, and the piezoelectric

device (603,619) is recharged in the section wherein said voltage is applied (figs.8,9;col.8, lines 10-25).

Regarding claim 14, Ishikawa as modified by Matsuo et al further teaches wherein the pressure generating means (603,619 of fig.8 of Ishikawa) for generating the pressure for pressurizing the ink of the pressurized ink chamber is a piezoelectric device, a displacement direction of which is d33 (figs.9; col.8, lines 10-25).

Regarding claim 15, Ishikawa as modified by Matsuo et al further teaches support sections (619 in fig.8 of Ishikawa; 15 in fig.5 of Matsuo et al) of the piezoelectric device (603,619 in fig.8 of Ishikawa; 13 in fig.5 of Matsuo et al) support partitions of the pressurized ink chamber (613 in fig.8 of Ishikawa; 4 in fig.5 of Matsuo et al).

8. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusunoki (US 2003/0001912) in view of Matsuo et al. (US 6,488,349).

Regarding claim 1, Kusunoki '912 teaches an image formation apparatus (fig.3) capable of forming a relatively large ink drop by sequentially discharging a plurality of ink drops from an ink drop discharging head (1, figs.1-3), the image formation apparatus (fig.3) comprising:

pressure generating means (15, figs.1-2) for discharging one or more of the ink drops other than an ink drop that is not followed by any more of the ink drops in a given printing cycle (the last ink drop) at an interval nearly equal to (n+1/2) x Tc, where n is an integer equal to or greater than 1, and Tc represents a resonance cycle of a pressurized ink chamber of the image

formation apparatus, the interval being measured from when a corresponding preceding ink drop is discharged (see fig.10, the interval between the consecutive ejecting pulses P2' is nearly equal to 1.5 x Tc which is equal to (1+1/2) x Tc ; see fig.11 the interval between the consecutive ejecting pulses P2'' is equal to 1.5 x Tc which is equal to (1+1/2) x Tc; see fig.8, the interval between the consecutive ejecting pulses P2 is equal to 2.5 x Tc which is equal to (2+1/2) x Tc).

Kusunoki '912 does not expressly teach the sequential ink drops merges before reaching a print target medium.

However, from the same endeavor Matsuo et al teaches merging sequential ink drops (figs.7,14) before reaching a print target medium (41, fig.1) in order to form large ink drop. The ink drops are merged by ejecting the ink drops such that the later discharged ink droplet has a higher discharge velocity than that of a previously discharged ink droplet for example by adjusting voltage amplitude as shown in figs.16 and 17 (also by adjusting other parameters of the wave forms as shown in figs.12,13, and 15).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the driving wave form of Kusunoki '912 (figs.8, 10, 11) to cause ejection such that the sequential ink drops ejected merges before reaching a print target medium during formation of large ink drops based on the teachings of Matsuo et al (figs.14, 16, 17). The motivation being in this method of forming large ink drops, all of the merged ink drops reaches the recording medium at the same time (at once), thus the merged ink drops dry uniformly which improves the uniformity ,quality, of the large ink drops formed thereby enhancing the printing image quality.

Regarding claim 2, Kusunoki ‘912 further teaches wherein one or more of the ink drops other than the last ink drop are discharged at an interval nearly equal to 1.5 x Tc (see fig.10, the interval between the consecutive ejecting pulses P2' is nearly equal to 1.5 x Tc; see fig.11 the interval between the consecutive ejecting pulses P2'’ is equal to 1.5 x Tc).

Regarding claim 3, Kusunoki ‘912 further teaches ink drops other than the one or more ink drops that are discharged at an interval nearly equal to (n+1/2) x Tc (see fig.10, the interval between the consecutive ejecting pulses P2' is nearly equal to (1+1/2) x Tc ; see fig.11 the interval between the consecutive ejecting pulses P2'’ is equal to (1+1/2) x Tc; see fig.8, the interval between the consecutive ejecting pulses P2 is equal to (2+1/2) x Tc) are discharged at an interval nearly equal to n x Tc (see fig. 4, the interval between the consecutive ejecting pulses P2 is equal to 2 x Tc; Furthermore, in figs.8,10,11, the intervals 2.5 x Tc, 1.5 x Tc, 1.5 x Tc respectively are also nearly equal to n x Tc).

Regarding claim 4, Kusunoki ‘912 further teaches wherein a first ink drop is discharged by the pressurized ink chamber (11, fig.1) being contracted (by pulses P2 in figs.4,8,10,11) after being expanded (by pulses P1 in figs.4,8,10,11), where a volume of contraction (by pulses P2 in figs.4,8,10,11) is greater than a volume of expansion (by pulses P1 in figs.4,8,10,11), and where the volume of expansion may take a positive value or zero (see figs. 4,8,10,11 the expansion of chamber 11 due to pulses P1 takes a positive or zero value, and the amount of expansion and contraction can be controlled by controlling the amplitude and/or the width of pulses P1 and P2 as shown in figs.10,11 of Kusunoki and figs.7B,8,9, 16 of Matsuo et al).

Regarding claim 5, Kusunoki '912 further teaches a second ink drop is discharged at an interval nearly equal to (n+1/2) x Tc from the first ink drop that precedes the second ink drop (in fig.10, the interval between the consecutive ejecting pulses P2' is nearly equal to (1+1/2) x Tc ; in fig.11 the interval between the consecutive ejecting pulses P2'' is equal to (1+1/2) x Tc; in fig.8, the interval between the consecutive ejecting pulses P2 is equal to (2+1/2) x Tc).

Regarding claim 6, Kusunoki '912 substantially teaches the claimed invention (see the rejections above and fig.9) except for the speed of one of the ink drops is set at greater than 3 m/s, and at a speed at which the sequential ink drops are merged. It would have been obvious to one having ordinary skill in the art at the time the invention was made to eject an ink drop at greater than 3 m/s, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233

Regarding claim 7, Kusunoki '912 as modified by Matsuo et al. further teaches wherein four or more of the sequential ink drops merge during flight to form one of the relatively large ink drops (Matsuo et al in figs.7, and 14 teaches the merging of 3 ink droplets to form large ink drop Q123, figs.12b, 13b, 15b, 16b, 17b teaches how to select the required number of ejecting pulses that merges to from large ink drop. Thus it is obvious to form a large ink drop by merging four or more ink drops depending on the size of the large ink drop and the merging ink drops).

Regarding claim 8, Kusunoki '912 as modified by Matsuo et al further teaches a waveform containing driving pulses (figs.4, 8, 10,11of Kusunoki, figs.16, 17 of Matsuo et al) for discharging the sequential ink drops includes a waveform for suppressing a residual vibration after a driving pulse for discharging the last ink drop (S13 in fig.9, P15 in fig.11 of Matsuo et al).

Regarding claim 9, Kusunoki '912 as modified by Matsuo et al further teaches the waveform for suppressing the residual vibration (S13 in fig.9, P15 in fig.11 of Matsuo et al) is provided within an elapsed time equivalent to Tc after the last ink drop is discharged (figs.4, 8, 10,11of Kusunoki).

Regarding claim 10, Kusunoki '912 as modified by Matsuo et al further teaches a medium-sized ink drop and a small-sized ink drop are each formed by selecting a part of driving pulses for forming the relatively large ink drop (in fig.14 Matsuo et al teaches small ink drops Q1 and Q2 forming a medium size drop Q12 and a small drop Q3 and medium drop Q12 forming large drop Q123).

Regarding claim 11, Kusunoki '912 as modified by Matsuo et al further teaches the driving pulses include a waveform for vibrating a meniscus without causing an ink drop to be discharged (S13 in fig.9, P15 in fig.11 of Matsuo et al).

Regarding claim 12, Kusunoki '912 as modified by Matsuo et al further teaches the driving pulses (figs.4, 8, 10,11of Kusunoki) include a section wherein a voltage is applied to the

pressure generating means (15 figs.1-2) for pressurizing ink in the pressurized ink chamber (11) (see also figs. 6-9,11,16 of Matsuo et al).

Regarding claim 13, Kusunoki '912 as modified by Matsuo et al further teaches the pressure generating means (15,figs.1,2 of Kusunoki) is a piezoelectric device, and the piezoelectric device (15) is recharged in the section wherein said voltage is applied (figs.4, 8, 10,11).

Regarding claim 14, Kusunoki '912 as modified by Matsuo et al further teaches wherein the pressure generating means (15, figs.1, 2 of Kusunoki) for generating the pressure for pressurizing the ink of the pressurized ink chamber is a piezoelectric device, a displacement direction of which is d33 (see figs.4, 8, 10, 11; chamber 11 is contracted in inward direction when pulses P2 are applied to pressure generating means 15).

Regarding claim 15, Kusunoki '912 as modified by Matsuo et al further teaches support sections (14, figs.1, 2 of Kusunoki; 15 in fig.5 of Matsuo et al) of the piezoelectric device (15 figs.1, 2 of Kusunoki; 13 in fig.5 of Matsuo et al) support partitions of the pressurized ink chamber (11 figs.1, 2 of Kusunoki; 4 in fig.5 of Matsuo et al).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENOK LEGESSE whose telephone number is (571)270-1615. The examiner can normally be reached on Mon - FRI, 7:30-5:00, ALT.FRI EST.TIME.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LUU MATTHEW/
Supervisory Patent Examiner, Art Unit 2861

H.L.
03/07/2008